Topic: Laws of logarithms

Question: Write the expression as a rational number if possible, or if not, as a single logarithm.

$$\log_3 54 - \log_3 2$$

Answer choices:

A $-\log_3 9$

B 9

C $\log_3 27$

D 3

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Solution: D

First, use the rule

$$\log_a x - \log_a y = \log_a \frac{x}{y}$$

to rewrite the given expression.

$$\log_3 54 - \log_3 2$$

$$\log_3 \frac{54}{2}$$

$$\log_3 27$$

To simplify further, use this rule

If $\log_a x = y$ then $a^y = x$

So if we let $\log_3 27 = y$ then $3^y = 27$. Therefore, $y = 3$.

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Topic: Laws of logarithms

Question: Which expression is equal to 1?

Answer choices:

A $\log_5 20 - \log_5 10$

B $\log_3 18 - \log_3 6$

C $\log_2 8 - \log_2 7$

D $\log_8 128 - \log_8 2$

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Solution: B

Use these two rules to evaluate each expression.

$$\log_a x - \log_a y = \log_a \frac{x}{y}$$

If $\log_a x = y$ then $a^y = x$

Applying these to the answer choices gives

A $\log_5 20 - \log_5 10 = \log_5 \frac{20}{10} = \log_5 2$

B $\log_3 18 - \log_3 6 = \log_3 \frac{18}{6} = \log_3 3 = 1$

C $\log_2 8 - \log_2 7 = \log_2 \frac{8}{7}$

D $\log_8 128 - \log_8 2 = \log_8 \frac{128}{2} = \log_8 64 = 2$

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